Journal of Scientific Research and Development 3 (2): 28-32, 2016
Available online at www.jsrad.org
ISSN 1115-7569

Strength group of Engkabang jantong as fast-growing indigenous species timber in Sarawak

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Abstract: Engkabang jantong is one of fast-growing indigenous species of Sarawak. Due to shortage of the source for heavy hardwood in the timber industries, an effort had been carried out to identify alternative species. Small clear sample is the most suitable for strength properties test. This paper aimed to acquire the strength group of fast-growing indigenous of Engkabang jantong compared with *Acacia mangium* as reference point. Strength properties at green and dry conditions are required namely bending parallel to grain, compression stress parallel to grain, shear parallel to grain and modulus of elasticity. The MS 544: Part 2 (2001) was used for strength group identification by converting the ultimate stresses obtained from strength properties into basic and grade stresses. It was founded that, Engkabang jantong of Sarawak classified under strength group SG6 as compared to *Acacia mangium* classified under strength group SG5.

Key words: Bending parallel to grain; Compression stress parallel to grain; Shear parallel to grain; Modulus of elasticity; Basic stress; Grade stress

1. Introduction

Engkabang jantong with biological name *Shorea marcophylla* is very well-known among the Iban people in Sarawak. The tree group which comprising of twenty species of a sub-family *Shorea* in Dipterocarpaceae in Sarawak (Smythies, 1985; Anderson, 1980). In Brunei, Engkabang jantong is appearing to correspond to a local species' group as Kawang and Tengkawang in Indonesia (Ashton, 2006). This confusion is recognizable between researchers and between Sarawak and Indonesia (Hotta, 1997). Engkabang jantong is well-known to produce big nuts known as illipe nuts to produce the illipe nut butter (Lee et al., 1997). The habitat of Engkabang jantong is found mainly in tropical lowland rainforest trees, especially in secondary growth frequently along rivers and in areas, which are periodically inundated. This species is known as one of the fastest growing species of the genus (Ashton, 1998).

The tree diameter can reach up to 50 m tall, and 130 cm diameter (SFD, 2011). The tree is lightweight reddish and yellowish timber. The timber is a light hardwood with a density of 0.415 to 0.625 g/cm^3 air-dry (MTC, 2006). According to Gan et al. (1998) from FRIM, the density at air-dry is ranged from 0.385 to 0.755 g/cm^3. The texture is rather coarse, and the grain is straight to shallowly interlock and somewhat lustrous. It does not have any distinctive odour or taste (Gan et al., 1998). Mechanical properties at air-dry condition given that for MOE and bending parallel to the grain are 7900 N/mm^2 and 46 N/mm^2, respectively. Furthermore, the compression strength for perpendicular and parallel to grain are 2.21 N/mm^2 and 24.50 N/mm^2, respectively. Meanwhile for shear strength is 6.30 N/mm^2 (HAIFOR, 2010).

Study conducted by Gan et al. (1998) showed that at green condition the MOE, bending parallel to the grain and compression parallel to grain are 9300 N/mm^2, 50 N/mm^2 and 25.6 N/mm^2, respectively. Meanwhile, at air-dry condition MOE, bending parallel to the grain and compression parallel to grain are 10200 N/mm^2, 63 N/mm^2 and 34.5 N/mm^2, respectively. *Acacia mangium* (Fabaceae: Mimosoideae) is a perennial tree native to Australia and Asia. Common names for it include Black Wattle, Hickory Wattle and Mangium. This species is selected for this study as a reference point. At the green soaked volume the density value ranges from 0.420 to 0.483 g/cm^3 meanwhile at the dry condition it varies between 0.5 to 0.6 g/cm^3 (Logan and Balodis, 1982; Peh and Khoo, 1984; Peh et al., 1982; Razali and Kuo, 1991; Sasaki and Razali, 1989)

). *Acacia mangium* at green condition reported with 114% of moisture content (MC) and 0.51 g/cm^3 of basic density (Alik, 1999). The MOE, bending parallel to the grain and compression stress parallel to grain at green condition were reported to be with 10900 MPa, 86.4 Mpa and 36.80 MPa, respectively and classified under Compressive Strength Group C, (Alik, 1999). It is understood that density of timber is relatively reflected the strength of the timber; however it should not be the definite measurement of its strength (Ismaili et al., 2015). Some physical testing have to be conducted to reveal and confirmed

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